THE AUSTRIAN ARCTIC EXPEDITION[1]

IN addition to the points referred to in our article of last week, there are several others touched on in Lieut. Payer's work, which, in view of some of the results of our own expedition, it may not be unprofitable to dwell upon. Indeed a comparison between the observations and deductions of so keen and accomplished an observer as Payer and those of Capt. Nares's party, when these have been fully published, might, we think, lead to a distinct advance of our knowledge of the Arctic basin. And here we may be allowed to say that when so experienced and cautious an Arctic explorer as Payer expresses a decided conviction, as we understand he has done, that Capt. Nares acted in the only way possible under the circumstances, and no expedition could have been better conducted, surely it is a strong proof that our expedition was essentially successful.

The translator in his Preliminary Notice refers to the ice-experiences of the Austrian expedition as compared with those of the English expedition, and finds in many points a striking similarity between them. We have already referred to the tedious journey of the *Tegetthoff* party over the piled-up ice after they abandoned the ship, when they were able to make only nine miles in two months, suggesting inevitably the now well-known and ever-memorable experiences of Capt. Markham and his party. To all appearance this retreat of the Austrians was over a part of the same field which held the *Tegetthoff* in its grip, and which those on board saw in the very process of changing from a level floe to mountains of ice, as Payer calls them. It seems to be inferred by some that the ice of such enormous thickness met with by Markham was the result of the freezing of layer on layer through a long succession of years, since the last glacial epoch as it has been put—only of course a violent figure of speech. This notion we believe to be open to question.

"The thickness which ice acquires in the course of a winter," Payer says, in his instructive chapter on "The Frozen Ocean," "when its formation is not disturbed, is about eight feet. In the Gulf of Boothia, Sir John Ross found the greatest thickness about the end of May; it was then 10 feet on the sea and 11 feet on the lakes. In his winter harbour in Melville Island Parry met with ice 7 or 7½ feet thick; and Wrangel gives the thickness of a floe on the Siberian coast, which had been formed in the course of a winter, at 9½ feet. According to the observations of Hayes the ice measured 9 feet 2 inches in thickness in Port Foulke. He estimates it, however, by implication, far higher in Smith's Sound: 'I have never seen,' he says, 'an ice-table formed by direct freezing which exceeded the depth of eighteen feet.' The rate at which ice is formed decreases as the thickness of the floe increases, and it ceases to be formed as soon as the floe becomes a non-conductor of the temperature of the air by the increase of its mass, or when the driving of the ice-tables one over the other, or the enormous and constantly accumulating covering of snow places limits to the penetration of the cold. While therefore the thickness which ice in free formation attains is comparatively small, fields of ice from 30 to 40 feet high are met with in the Arctic Seas; but these are the result of the forcing of ice-tables one over the other by pressure, and are designated by the name of 'old ice,' which differs from young ice by its greater density, and has a still greater affinity with the ice of the glacier when it exhibits coloured veins."

It seems evident, then, that the palæocrystic ice, like the ice in which the *Tegetthoff* was beset, is not the result of direct freezing of layer on layer, but to a great extent the result of pressure, by which a wide field may be broken up, and the pieces so piled over each other as to form impassable mountains and valleys. How this is accomplished may be learned from the impressive description of Lieut. Payer:—

"A dreadful day was the 13th of October—a Sunday; it was decisive of the fate of the expedition. . . . In the morning of that day, as we sat at breakfast, our floe burst across immediately under the ship. Rushing on deck, we discovered that we were surrounded and squeezed by the ice; the after part of the ship was already nipped and pressed, and the rudder, which was the first to encounter its assault, shook and groaned; but as its great weight did not admit of its being shipped, we were content to lash it firmly. We next sprang on the ice, the tossing tremulous motion of which literally filled the air with noises as of shrieks and howls, and we quickly got on board all the materials which were lying on the floe, and bound the fissures of the ice hastily together by ice-anchors and cables, filling them up with snow, in the hope that frost would complete our work, though we felt that a single heave might shatter our labours. But, just as in the risings of a people, the wave of revolt spreads on every side, so now the ice uprose against us. Mountains threateningly reared themselves from out the level fields of ice and the low groan which issued from its depths grew into a deep rumbling sound, and at last rose into a furious howl as of myriads of voices. Noise and confusion reigned supreme, and step by step destruction drew nigh in the crashing together of the fields of ice. Our floe was now crushed, and its blocks piled up into mountains, drove hither and thither. Here they towered fathoms high above the ship, and forced the protecting timbers of massive oak, as if in mockery of their purpose, against the hull of the vessel; there masses of ice fell down as into an abyss under the ship, to be engulfed in the rushing waters, so that the quantity of ice beneath the ship was continually increased, and at last it began to raise her quite above the level of the sea."

It can easily be imagined that were ice which had been subjected to such a process to get jammed permanently into any position, it would become a formidable barrier to all passage over or beyond it. But the question arises—Does such mountainous ice never break up? Are these areas in the Arctic basin eternally covered with such ice, or is there a perpetual movement going on all over the Polar region? That the palæocrystic ice is not a fixture in the position in which our expedition found it we endeavoured to show in a previous article; if the observations of Hall and his party are to be trusted, and we believe they are perfectly reliable, the southern latitude of the formidable barrier must change considerably. That there is an open Polar Sea we do not think there is the least ground for believing. So far as we have seen, its only serious advocate is Dr. Hayes, one of its surviving "discoverers," and it is not to be at all wondered at that he should cling fondly to his pet theory. It is to be regretted that he did not wait for Capt. Nares's report, ere he rushed to an attack of the conduct and results of the English expedition; he might then have spoken more coolly and courteously. At Cape Fligely Lieut. Payer came upon a large stretch of open water which one less well-informed and with less of a scientific training might at once have eagerly taken for the border of an "open Polar Sea." Not so Lieut. Payer, who has no faith in such a dream; he took his open water for what it undoubtedly was seen to be on careful inspection, a polynia, or water-hole. Here is his opinion on the question. After referring to the experiences of previous explorers he says:—

"Those propitious ice-years amount, therefore, to nothing more than a greater recession of the outer ice-barrier—trifling when compared with the mighty whole—or to an increased navigability of certain coast waters, or to a local loosening of the inner polar ice-net. In reality the whole Arctic Sea, with its countless ice-fields and floes, and its

[1] "New Lands within the Arctic Circle. Narrative of the Discoveries of the Austrian Ship *Tegetthoff* in the Years 1872–1874." By Julius Payer, one of the Commanders of the Expedition. Maps and numerous Illustrations. Two vols. (London: Macmillan and Co., 1876.) Continued from p 65.

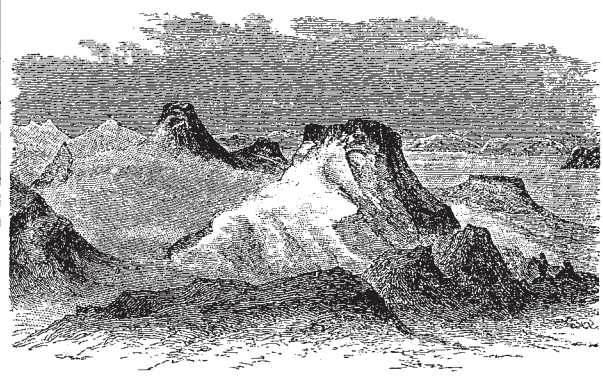
web of fine interlacing water-ways, is nothing but a net constantly in motion from local, terrestrial, or cosmical causes. All the changes and phenomena of this mighty network lead us to infer the existence of frozen seas up to the Pole itself; and according to my own experience gained in three expeditions I consider *that the states of the ice between* 82° *and* 90° N.L. *will not essentially differ from those which have been observed south of latitude* 82°; *I incline rather to the belief that they will be found worse instead of better.*"

Noon on December 21, 1873.

This is almost prophetic of the results obtained by the English expedition, and is one more proof of the accuracy of their observations. Still that there are one or more bodies of open water in the polar basin, bodies which are never permanently frozen over seems evident from even the comparatively little information we have.

Icebergs at the Base of the Middendorf Glacier.

The ice seems to be in almost constant motion within the basin except in the immediate vicinity of coasts, and in order that this may happen there must be open spaces somewhere. The southern edge of the Novaya Zemlya ice varied in the years 1871-2-4 by about 300 miles, and Hall saw only water and easily penetrable ice where our sailors were baffled by the impenetrable ancient ice. This simply shows that there is a constant shifting of the southern ice border, but that its position and that of whatever open water exists within the basin itself will ever be so favourable as to enable a ship to navigate to the Pole is to us quite incredible. That the polar ice, like all other phenomena, is subject to some laws in its movements, we must believe; what these are we as yet know not, but that they have some connection with the sun-spot period, is most likely. These and other points can only be satisfactorily settled by an international ring of Arctic observatories.



The View from Cape Tyrol. Collinson Fiord—Wiener Neustadt Island

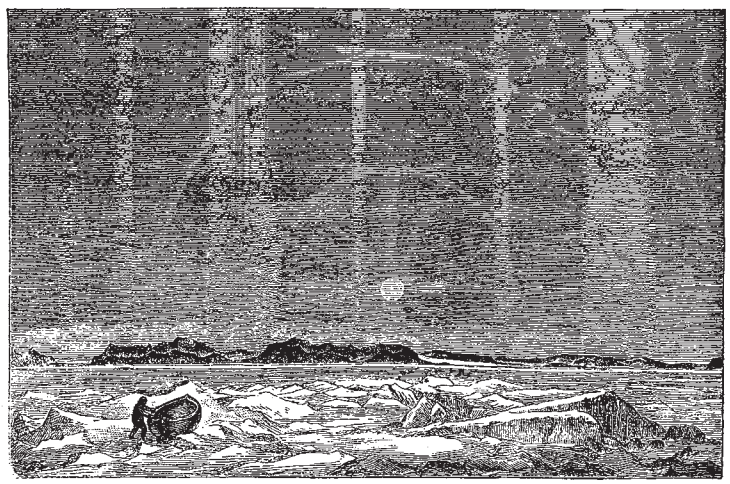
As to the future of the polar question, Payer believes that the days of large expeditions are past, and that until we are able to devise some aërial method of reaching or crossing the polar area, we ought to content ourselves

with completing our knowledge of what has been discovered, and carrying on observations on the plan proposed by Lieut. Weyprecht. Still that there will be attempts to penetrate farther northwards we think is very likely; and should any other nation surpass the latitude attained by Markham's party, or even find the secret of the pole itself, the English nation will not grudge it the honour. Ballooning has, since the return of our expedition, been frequently advocated as a means of polar exploration, and it may be interesting to mention that more than twenty years ago Parry used balloons as a means of scattering messages while his ship was frozen up.

The meteorological observations of the Austrian expedition are likely to be of the greatest value when fully published. Some data are given in the appendix, and a few extracts in the text from Admiral von Wüllerstorf-Urbair's analysis of them.

The observations made use of by Admiral v. Wüllerstorf-Urbair are those of the winds, including both direction and force, and such of the astronomical observations as served to fix the positions of the ship while it drifted in the ice from Novaya Zemlya to Franz-Josef Land. The results were published in two charts in Petermann's *Mittheilungen* in 1875, which show the positions of the ship from August 24, 1872, to November 1, 1873, and the mean direction of the wind at the same times. They are deeply interesting from the light they seem to cast on the air and sea currents over this portion of the Arctic Sea. Speaking generally, during the first half of the course, or from October to the beginning of February, westerly and southerly winds prevailed and, during the latter half easterly and northerly winds; these winds being, it may be remarked, in accordance with the mean distribution of atmospheric pressure for the different regions and months respectively. The ice-drift followed approximately a similar course, subject apparently, however, to deflections which may be supposed to be due to the coasts of Novaya Zemlya and Franz-Josef Land, and to powerful ice-drifts from the Kara Sea and from the sea to eastward of Franz-Josef Land. From the investigation so far as carried out, it is concluded that in the sea lying between Novaya Zemlya and Franz-Josef Land the existence of a sea-current is probable, the prevailing winds being also in accordance with this supposition, and that a great expanse of sea to the north and north-east of Novaya Zemlya is also probable.

We look forward with much interest to the publication of the detailed account of the meteorological work of this expedition for the elucidation of several questions, such as the remarkable changes in the course of the ice-drift in the end of 1872 and beginning of 1873, viewed in connection with the weather of Northern Europe at the time. Thus, at Archangel the barometer rose on November 4 to 30·476 inches, fell on the 8th to 29·118 inches, and on the following day the temperature rose to 33°·8; immediately after this the wind shifted from S.W. to N.E., temperature fell to – 13°·0 on the 11th, and the barometer rose to 30·717 inches on the 13th. The great deviation in the course of the ice-drift, which extended from November 9, 1872, to February 2, 1873, began with this rise of the barometer, shift of the wind, and fall of the temperature at Archangel. Again, during January, 1873, the mean height of the barometer was 30·027 inches at Archangel; 29·826 inches at Kem, on the west coast of the White Sea; 29·838 inches at Vardö and 29·770 inches at Alten, both in the extreme north of Norway; 29·229 inches at Thorshavn, Farö; and 29·131 inches at Stykkisholm, Iceland. In connection with the remarkably disturbed state of the atmosphere in this arctic and sub-arctic region, as indicated by these figures, it is to be remarked that it was just during this time that the most remarkable deviation from the general course of the ice-drift took place. On January 2 the course suddenly changed from a north-north-westerly direction to a direction almost due east, which was steadily maintained untill February 2, when it again suddenly changed



Parhelia on the Coast of Novaya Zemlya.

Ice Pressure in the Polar Night.

to a north-north-westerly direction, the ship having drifted between these dates from 66° 50′ to 73° 20′ long. E.

No more powerful argument, we think, could be adduced than these facts for the establishment of a series of Arctic observatories; the influence of the changing Arctic conditions on the climate of Europe is unmistakable, and a knowledge of what these conditions are, and what laws they are subject to, would undoubtedly be of great practical value.

The chapter on the aurora is very interesting; it contains the valuable observations by Lieut. Weyprecht, which we published in NATURE, vol. xi., p. 368. Contrary to the experience of our own expedition and others in high latitudes on the American side, the auroras seen by the *Tegetthoff* were remarkably brilliant. No sound of any kind was observed to accompany the phenomenon.

Lieut. Payer's work, though professing to be only a popular narrative of the expedition, contains, it will be seen, much of great scientific interest, and we repeat that in the discussion of the results of our own expedition, his observations and conclusions will be found of real value.

OUR INSECT FOES

THE receipt of the eighth Annual Report on the noxious, beneficial, and other insects of the State of Missouri, and the conferences on insect destruction in connection with the Paris Insect Exhibition recently held, bring again prominently forward the question—what are we to do to cope with our insect foes? Mr. Riley, the State entomologist for Missouri, in his report, gives account of five noxious insects—the Colorado Potato-beetle (*Doryphora 10-lineata*, Say), the Canker Worms (*Paleacrita vernata*) and (*Anisopteryx pometaria*), the genus Paleacrita being a new one; the Army Worm (*Leucania unipuncta*, Han.), the Rocky Mountain Locust (*Caloptenus spretus*, Tho.), and the Grape Phylloxera. In each case an account is given of the estimated amount of damage done, and the proposed methods for attacking the enemy, as well as the life history, so far as is known, of the insect itself. While the damage by Colorado Beetle during 1875 was less than usual, owing to the excessive wet drowning the broods, and the Army Worm did comparatively little damage, the devastation caused by the locust was unusually heavy. Mr. Riley gives separately the accounts of different counties of the State.

One or two quotations will serve to indicate the gravity of the question, what is the remedy to be adopted? For example, in the account of Jackson County—"All kinds of growing crops disappeared before the black dead line of their advance. . . . With all the crops of wheat, rye, oats, flax, clover, corn, gardens, and pastures consumed in defiance of every human effort to stay the general devastation, the fields being as bare as the public roads, the outlook was gloomy beyond description. Many gave up in despair and left the county." So great was the destitution that relief meetings were held, the story of suffering being that many were reduced to a scanty supply of bread. Take again Buchanan County (written June 7): "The crops are all destroyed now, together with meadows and pastures." Again, Bates County: "all our crops and pastures eaten off until they are as bare as in mid-winter." St. Clair County: "The terrible sights of the cruel war are now being outdone by the cruellest of sights—starvation." And so on with a large proportion of the counties. Some counties were so fortunate as to escape with small damage. The total loss to the State for the year is set down at $15,000,000. A day of supplication to Almighty God, with fasting, was ordered on June 3 by the Governor. Mr. Riley, however, repudiates the idea that this calamity was a divine visitation, and quotes from a speech he made in the previous May, in which he said, "When I suggested last winter that a law should be passed offering a bounty for the eggs, the idea was ridiculed, but the people see now how wise such a course would have been. A few thousand dollars appropriated by the legislature for the purpose would have been the means of averting the present injury" (p. 93). The accounts given from some States describe the air as thick with locusts on the wing, so that darkness as of twilight was produced. We fortunately in England do not suffer from the locust, but we may learn a lesson as to what is the course considered necessary for coping with insect ravages. Nothing short of an Act of Congress to enforce the action to be taken seems to be regarded as of any real use. Although districts have previously suffered to the verge of starvation, we find Mr. Riley saying (p. 132), "It is very evident that if anything can be done at all in averting this evil, it must be done by national means. The advantage of having the matter properly investigated by the national government has been repeatedly urged by many prominent persons in the west best competent to judge." Societies have recently passed resolutions, the resolutions have led to a memorial, and the memorial to the introduction of two bills into Congress. The one proposed the appointment of a commission of three by the Commissioner of Agriculture, who are to report on the best means of preventing incursions of the locusts. The other proposed that the Secretary of the Interior shall appoint a board of three entomologists on the nomination of the National Academy of Sciences. They were to report on noxious insects generally, and "as soon, also, as the information gathered shall enable them, the commissioners shall compile practical instructions for the suppression of the different insects referred to." The amendments to both these bills were finally adopted in this form:—"That it shall be the duty of the Commissioner of Agriculture to investigate and gather information relative to those insects, &c. . . . and to make public from time to time such information and practical instructions for the suppression of the different insects." This, Mr. Riley remarks, is what people outside the senate were in the habit of supposing to be his duty. The chief practical suggestion Mr. Riley has to make is that State aid should be given for bounties of so many cents a bushel for the young insects while hatching. It will be some time, however, before we shall know what the Commissioner of Agriculture proposes to have done. Dr. Leconte, in his address before the American Association for the Advancement of Science at Detroit last year, urged the need for a law to compel farmers to destroy insects on their lands at a particular time.

Let us now turn to what has been done in France. We have already in a note, a few weeks ago, mentioned the way in which it is sought, through the elementary schools, to spread a knowledge of practical entomology. It remains now to refer to the attempts at legislation. As far back as 1732 a law was passed ordering farmers and landowners to destroy the caterpillars on their lands under a penalty of fifty livres. This 1732 law was renewed by prescriptions in 1777 and 1787. During the revolution, fines were abolished and rewards for destruction were substituted. It was found this plan was of no practical use. In 1796 the law known as that of 26 Ventose, an. iv. was passed. It enacted that the destruction of caterpilliars should be effected by the owners or tenants of land, and that if they neglected to do it the adjoints were to have it down and recover the expense from the negligent owner or tenant. The public lands were to be done at public cost, and the *Commissaires du Directoire Exécutif* were to visit the districts to see that all been carried out. The penalty fixed was not less than three nor more than ten days labour, in addition to repaying the expenses incurred by the employment of workmen. This law, made in 1796, is still the law for France, though practically it is not put in force. The local officials were found to hesitate in the performance